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ABSTRACT

This training unit on safety is part of a 17-unit course package written to aid instructors in the development, teaching, and evaluation of fire fighters in the Wisconsin Fire Service Certification Series. The purpose stated for the 4-hour unit is to assist firefighters in understanding the hazards of their profession and some methods of reducing the injuries and deaths that can occur. An instructor's guide sheet provides this information: introduction to the topic, instructor preparation, length of unit, methods of instruction, testing, equipment and facilities required, recommended visual aids, and references. Following a list of unit objectives, a lesson plan outlines the main teaching points and states the preferred teaching method, cites the reference and page number(s) where the information is to be found, and indicates the necessary handouts. Other contents in the unit include a unit quiz, answer key to the quiz, and handouts (graphs, student worksheets, informational material, and forms). (YLB)

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FIRE SERVICE CERTIFICATION SERIES

UNIT FSCS-FF-2-80

SAFETY

FIRE SERVICE TRAINING

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SAFETY

Prepared by:

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Fire Service Training

INTRODUCTION

This unit has been developed to assist the firefighters in understanding the hazards of their profession and some methods of reducing the injuries and deaths which have occurred.

Injuries and deaths of firefighters are occurring in unacceptable numbers and the statistics are available from various agencies to prove the dismal facts..

Some may use this information to convince an indifferent public that fighting fires is a dangerous endeavor undertaken only bu unselfish and courageous individuals who indeed qualify for the definitions of "hero." The general public does need education in many areas concerning the whole fire problem, that is not the use made here of the existing figures.

Rather, the purpose is to serve others within the fire service who look at these frightening statistics of injuries and deaths and are determined to work for reduction of the risks and reduction of the losses.

Firefighters take on their great responsibilities knowing that the job is inherently dangerous to health and life. Furthermore, fighting fire will never be made absolutely safe, but it is time to make an extra effort to begin controlling the hazards wherever possible.

INSTRUCTOR PREPARATION

Carefully study the objectives to determine the goals that have been set for the firefighters upon completion of this unit.

Review the lesson plans and if necessary, consult the references listed.

Develop suitable audio-visual aids, provide training area and necessary tools and equipment to effectively teach this unit.

LENGTH OF UNIT

Classroom Work	3 hours	30 minutes
Evaluation and Testing		30 minutes

METHODS OF INSTRUCTION

Lecture
Illustration/Demonstration

Suggested methods and techniques are listed under Instructor's Notes on the lesson plans. For further information consult Fire Service Instructor Training IFSTA #303, 3rd ed., pp. 71-83.

TESTING

At the end of this unit, a written quiz of five or more questions will be given.

EQUIPMENT AND FACILITIES REQUIRED

Classroom with necessary audio-visual equipment.
Sections of hose sufficient for class size.
Fire apparatus
Any films on firefighter safety or emergency vehicle driving that are available
Sample of protective clothing

REFERENCES

1. Hudiburg, E., and McCoy, C., Ed., Fire Service Rescue and Protective Breathing Practices, IFSTA #108, 4th ed., Stillwater, 1969, pp. 3-24

2. Laughlin, J.W., Carlson, G.P., and Osterhout, C.E., Ed., Firefighter Occupational Safety, IFSTA #209, 1st ed., Stillwater, 1979, pp. 31-191

OBJECTIVES

All objectives in this unit are to be met according to the material contained in the International Fire Service Training Association Manuals #108 Fire Service Rescue and Protective Breathing Practices and #209 Firefighter Occupational Safety.

To satisfactorily complete this unit, the firefighter must attain a grade of 70 or higher on the written quiz.

NFPA STANDARD 1001

SAFETY

Fire Fighter I

3-15 Safety

3-15.1 The firefighter shall identify and explain dangerous building conditions created by fire or disaster, and precautions to protect other firefighters as prescribed by the authority having jurisdiction.

3-15.2 The firefighter shall demonstrate procedures for action when trapped or disoriented in a fire situation, or in an hostile enviroment.

3-15.3 The firefighter shall demonstrate knowledge of safety procedures to be followed in use of all equipment and apparatus that the firefighter may be called upon to use.

3-15.4 The firefighter shall demonstrate the correct use of all safety equipment to be used in electrical emergencies as prescribed by the authority having jurisdiction.

COURSE: FIRE SERVICE CERTIFICATION SERIES

LESSON: SAFETY

EQUIPMENT NEEDED: SLIDE, OVERHEAD PROJECTORS, SCREEN

TRAINING AIDS: SLIDES, TRANSPARENCEIS, TEXTS

INSTRUCTORS NOTES

TEACHING POINTS

INTRODUCTION

The fire fighter injury rate for 1977 as reported by the International Association of Fire Fighters was such that 4 out of 10 fire fighters can expect to be injured, the first year on the job.

As a fire fighter you are five times as likely to be killed as an industrial worker.

Until a few years ago, it was difficult to determine why fire fighters were killed and disabled so often. Now as a result of studies by the Bureau of Labor Statistics, United States Fire Administration and especially, the International Association of Fire Fighter, we have some of the data necessary to determine why, how and where, fire fighters are injured.

It has been determined that many of these injuries can be eliminated by better training, protective clothing and devices, and simply by being made aware of the fact the hazard exists.

I. Injury Statistics

Ref. Firefighter Occupational Safety, 1st ed., IFSTA #209

IAAF Fire Fighter Mortality Report 1977

A. Where the fire fighters are injured

1. Fire scene	73.0%
2. Fire Station	17.0
3. Training	3.4%
4. Responding to or returning from alarm	5.7%
5. False alarm related	.3%
6. Harrassment	.4%

INSTRUCTORS NOTES

TEACHING POINTS

Refer to HANDOUTS 1-6

INTRODUCTION

I. Injury Statistics

B. Most frequent types of fire ground accidents

1. Sprains and Strains	32.0%
2. Cuts	15.0%
3. Inhalation of Toxic Gases	11.0%
4. Burns	9.0%
5. Over-Exertion	.2%
6. Heat Exhaustion	.2%
7. Broken Bones	.2%
8. Other	26.0%

828 fire fighters were forced to leave their departments because of occupational diseases in 1977.

513 had heart disease
91 lung damage
224 report did not specify cause

There were 84 fatalities in this period attributed to occupational diseases.

62% were attributed to heart disease
11% were attributed to lung disease
27% were unspecified in the report.

C. Specific injuries or results of above accidents.

1. Most severe-Heart strain

2. Most common-strains and sprains

INSTRUCTORS NOTES	TEACHING POINTS
Ref. Firefighter Occupational Safety, 1st ed., IFSTA #208	II. Safety in the Fire Station
pp. 31-63	A. Lifting
pp. 45-47	1. Fire Hose
Give demonstration of proper method of lifting and have class practice lifting sections of 2½ and 3-inch hose.	2. Other heavy objects
	B. Falls
	1. Poles and holes
pp. 32-34	2. Stairways
	3. Chutes or Slides
	4. Wet floors
	C. Striking stationary or moving objects
	1. Ladders or other equipment carried on apparatus
	2. Doors
	D. Horse Play
	E. Exertion
	1. Time of alarm
	2. Heart strain
	III. Personal Protective Clothing
pp. 65-101	A. Boots
	1. Steel toes
	2. Lightweight
	3. Steel midsole .018" thick
	4. Leather insoles - 3/16" thick
	5. Size
	6. Instep and shin protection

INSTRUCTORS NOTES	TEACHING POINTS
	III. Personal Protective Clothing
	A. Boots
	7. Care and Maintenance
pp. 87-89	a. worn heels should be replaced by vulcanizing the new heel to the boot. This process restores the original protective quality to the boot.
	b. oil, grease and debris should be washed from the boot since all have a detiorating effect on rubber.
	c. rubber detiorates faster at points of strain so boots should not be kept in the down position longer than a tour of duty.
	d. worn, cut or punctured boots that cannot be effectively repaired should be replaced.
	B. Turnout Coats
	1. Hazard Protection
pp. 75-83	a. impact b. burns c. insulation from heat of fire d. water and steam e. toxic liquid penetration f. exposure protection g. lining layers seem most important
	2. Other requirements
	a. comfort b. durability and wear c. appearance and visability d. functional requirements e. special problems
	C. Gloves
	1. Leather and Canvas
pp. 85-87	a. good against flame and heat b. good abrasion qualities c. absorb water and become stiff d. can be cut by sharp objects e. best for routine fire operations

INSTRUCTORS NOTES	TEACHING POINTS
	III. Personal Protective Clothing
	C. Gloves
	2. Vinyl Coated
pp. 85-87	a. good fit b. slipresistant c. abrasion resistant d. waterproof e. limited flame and heat protection
	3. Rubber Electric Type
	a. special purpose b. must be tested
	D. Helmets
	1. Suspension Type
pp. 70-74	a. leather, plastic, fiberglass b. cloth or synthetic tape webbing c. theory to absorb shock before it reaches head d. wide brim e. electrically non-conductive, except aluminum (No longer manufactured)
	2. Shell and Liner Type
	a. absorbs shock and dissapates it over surface of liner b. can withstand greater impact than suspension type from the side c. run off is a problem
	E. Eye Protection
pp. 89-93	1. Must protect eyes aginst particles, dust liquids.
	2. Full face shield may protect against heat.
	3. Polycarbonates fail with about 1 minutes exposure to 300 degrees F. (149 degrees C.)

INSTRUCTORS NOTES	TEACHING POINTS
	III. Personal Protective Clothing
	F. Specialized Clothing
pp. 84-85	1. "Acid Suits"
	2. Proximity Suits
	3. Entry Suits
	IV. Enroute Hazards
	A. Pre-emergency Response.
pp. 121-126	1. Driver is thoroughly trained to drive and operate assigned apparatus in a safe manner.
	2. Driver checks the mechanical condition of apparatus at the beginning of duty tour.
	B. Emergency Response
	1. Selecting Response Routes.
	a. driver must know response area and select the proper route taking some of the following situations into consideration when doing so.
	(1) construction and street repair (2) rush-hour traffic (3) parade routes (4) highly populated areas (5) railroad crossings, hazardous intersections and bridges (6) limited weight areas
	2. Fire Fighting Crew Riding Positions
	a. all personnel who can be seated inside the apparatus, crew cabs, extended cabs with jump seats, etc., will fasten seat belts before leaving the station.
If various types of apparatus are availble to the instructor, demonstrate the proper methods of mounting, riding on and dismounting from the apparatus to the class.	b, the fire fighters chance of injury in an accident is reduced by 85% just by using this simple device.
	c. all personnel must be wearing full protective clothing before the apparatus responds.

INSTRUCTORS NOTES	TEACHING POINTS
pp. 121-134	IV. Enroute Hazards 1. Safe Driving a. have apparatus under control (drive to meet the conditions) b. maintain a distance of 300 to 500 feet between responding apparatus c. personnel responding in their personal vehicles should maintain good discipline and drive with as much caution as any other vehicle and obey all applicable traffic laws. d. apparatus traveling in the same direction shall not pass one another unless absolutely necessary with the vehicle to be passed indicating it is safe to do so. e. when several apparatus are responding in line to an emergency, the drivers of the second, third or other vehicles should be especially alert citizens who may assume that only one apparatus is passing. 2. Traffic Laws a. all personnel should be knowledgable in traffic laws and rules governing their department. 3. Vehicle Characteristics 1. Understanding the Limitations and Characteristics of the vehicle is a necessity. a. steering characteristics b. stopping distances and acceleration c. vehicle stability
Refer to HANDOUT #7 pp. 131	4. Weather Conditions 1. Inclement Weather a. rain, fog b. ice, snow

INSTRUCTORS NOTES

TEACHING POINTS

Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209

pp. 133-134

5. Environmental Conditions

1. Hazards of urban driving conditions.

   a. rush hour traffic
   b. congestion at shopping centers, theater area and other places of public assembly or use
   c. parking of cars on residential streets
   d. pedestrian traffic

   e. children playing in school and residential areas

2. Hazards in rural areas.

   a. dust
   b. loose gravel
   c. narrow roads
   d. bridge weight limits
   e. long narrow access roads to rural buildings

3. Problems with "Turnpikes", "Freeways" and other controlled access roads and highways.

   a. Limited visibility on exit ramps to service roads

   b. using median strips or shoulder strips to get through traffic to the scene of the emergency

   c. DO NOT enter exit ramps in the WRONG direction unless the entire road system has been secured by law enforcement officers.

Pre-fire planning for response in these varied areas is extremely important and can save valuable response time as well as alleviate frustrating situations.

INSTRUCTORS NOTES

TEACHING POINTS

Ref. Firefighter Occupational safet 1st ed., IFSTA #209

pp. 134-135

V. Officer's Role

1. The responsibilities of the company officer or the individual riding the right side of the cab begin when the alarm is received.

   a. insure that the driver knows the correct location of the emergency - assist in the location process if necessary

   b. be aware of conditions which could alter the response routes and communicate this information to the driver

   c. assist the driver by watching for potential accident situations

   d. Operate radio and warning devices

   e. control the speed at which the apparatus is allowed to respond to emergencies

   Arrival At The Scene

   a. Forward Lay - "Catching the Hydrant"

      (1) come to a full stop at hydrant
      (2) make sure fire fighter is safely off apparatus with tools and hose
      (3) have hose secured to hydrant before proceeding to the fire

   b. Laying Lines- With Apparatus

      (1) If necessary to have fire fighters on the tailboard during this evolution, assign them a safe location

      (2) do not proceed at excessive speeds this is dangerous, results in wasted hose lays and could damage couplings and injure personnel or bystanders

      (3) DO NOT allow anyone to ride on or in hose beds of apparatus

   c. Elevated Platforms, Towers, Ladders

      (1) Many needless and unecessary risks can be avoided by calmly assession the situation before stopping for the set up of such large equipment.

INSTRUCTORS NOTES

TEACHING POINTS

V. Officer's Role

c. Elevated platforms, towers and ladders

(2) ground jacks on many apparatus require considerable room for operation and careless spotting of the apparatus may cause:

restricted operation of the apparatus

creation of tripping and stumbling hazards because of the position of the jacks or outriggers

FOR YOUR SAFETY

IT IS HIGHLY RECOMMENDED THAT SUCH DEVICES BE AT LEAST STRIPED WITH REFLECTIVE PAINT OR TAPE AND WHEREVER POSSIBLE, PROVIDED WITH VISIBLE WARNING LIGHTS WHEN IN THE EXTENDED POSITION.

Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209

pp. 143-160

I. The Emergency Scene

A. The hazards that the fire fighters must deal with at the emergency scene are many. Some examples of the most common are:

1. Animals

Animals on the fire scene can complicate the situation and pose an additional hazard to firefighters.

Dogs have increasingly become a threat to firefighter's safety as more and more property owners are securing dogs for burglar protection.

Security dogs are generally classified into three types, only one of which will attack anyone entering their area.

To protect the firefighters the following steps should be followed.

Pre-fire planning report contains:

a. locations of premises containing guard dogs.

b. emergency telephone numbers for assistance in restraining the dogs during an emergency

INSTRUCTORS NOTES	TEACHING POINTS
Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209 pp. 143-144	c. all premises containing guard dogs should be prominently placarded with warning signs so that firefighters can anticipate the hazard before entering the premises. d. methods of control (1) always leave a path of escape open for the dog(s) (2) always wear full protective clothing with boots pulled up and heavy gloves when entering these areas (3) use a pike pole or other available tool to give the dog something to bite on while you move to safety or secure assistance. (4) Use a booster line to hold the dog(s) off, or if this will cause water damage, short bursts from a carbon dioxide extinguisher will check the animal (5) try not to injure the dog(s) as they will become more vicious and also becaues they reoresent a considerable investment to the owner. e. Other Domestic Animals (1) almost any other type of animal from snakes to monkeys made be found in residences.. They are usually gentle but fright during a fire made make them difficult to handle. (2) livestock can be encountered in: rural areas transportation terminals food processing plants fire and smoke can excite these animals to a frenzy making them extremely difficult to remove from a burning building. Obtain assistance in their removal if possible and once removed, secure them with ropes, and move to some kind of enclosure, even an improvised one of apparatus and ladders. REMEMBER: TRY TO REMAIN AS CALM AS POSSIBLE SINCE THE ANIMALS SENSE FEAR AND BECOME EXCITE

INSTRUCTORS NOTES	TEACHING POINTS
Ref. Firefighter Occupational Safety, 1st ed., IFSTA #209 pp. 144-146	2. Fatigue Fatigued fire fighters are liely to become less careful and accidents and injuries can result. Some of the causes of fire fighter fatigue are: a. physical condition of fire fighter b. intense heat exposure coupled with high humidity c. performance of strenous firefighting activities while wearing protective clothing and equipment d. extremely cold weather
pp. 147-148 3-15 Safety 3-15.4	3. Electrical Exposure The fire department is frequently faced with emergency situations that include electrical hazards. a. structural fire with high voltage installation b. special rescue where downed wires are involved Preplanning for these emergencies with the advice of power company personnel should be a must for every department. A planned procedure that all department personnel are well trained in will lessen the likelihood of dangerous mistakes being made during electrical emergencies. A typical department policy for handling electrical exposure may include, but is certainly not limited to, the following points: o Prompt notification of power company personnel as soon as the existence of an electrical hazard is determined. o Allow power company personnel to handle all energized electrical equipment if possible. The exception to this policy would be when life is in immediate danger and rescue MUST be performed.

INSTRUCTORS NOTES

TEACHING POINTS

Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209

pp. 180-181

3. Electrical Exposure

- o When downed wires are encountered a danger zone of one span in either direction should be considered for safety.

  This is because other wires may have also been weakened by the short and fall at a later time.

- o A firefighter must guard not only against electrical shock and burns but also eye injuries from electrical arcs.

- o Treat all wires as "HOT" and being of high voltage.

- o From a safety standpoint, firefighters should not cut any wires but wait and let trained utility workers do any necessary cutting.

  ONLY IN THE MOST EXTREME CIRCUMSTANCES SHOULD THIS RULE BE EXCEPTED.

- o When an electrical hazard exists, always wear full protective clothing and use only insulated tools.

- o Care must be excercised in raising or lowering ladders, hoselines or equipment near overhead lines.

- o Proceed carefully in an area where wires are down and heed any tingling sensation felt in the feet. Because of the carbon in the boots a slight charge is transmitted indicating that the ground may be charged.

- o Do not park elevating apparatus under wires.

- o Do not touch any vehicle or apparatus that is in contact with electrical wires.

  YOUR BODY WILL COMPLETE THE CIRCUIT TO GROUND RESULTING IN ELECTRICAL SHOCK.

- O When more than one electrical wire is down, consider all wires equally dangerous when one is arcing and the other is not.

INSTRUCTORS NOTES	TEACHNING POINTS
Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209 pp. 180-181	3. Electrical Exposure o Straight streams are discourage when energized electrical equipment is encountered. Fog patterns should be used with at least 100 psi mozzle pressure. Applicators SHOULD NOT be used since they may act as a conductor. o Special consideration should be given for fences since once an energized electrical line contacts a fence or metal guardrail, the entire length becomes charged as long as it is continous. This can present a difficult hazard to protect people from because of the length of the fence.
p. 149	4. Noise on the Fire Scene Ruptured steam lines or product process lines, particularly in chemical plants, can produce unusually high noise levels. Apparatus operators should be provided with industrial-type ear protection where they will be exposed for more than a half hour to engine noises above 110 decibels. Other high noise levels frequently encountered on the fire scene are in areas where chain saws and high-speed rotary saws are in use. Provide adequate protection and consider communication.
	5. Ventilation The hasty placement of smoke ejector fans has resulted in injuries. When using smoke ejector fans remember to: a. place them in proper position b. insure adequate ventilation for exhaust fumes c. do not attempt to adjust carburetors or throttle unless properly trained to do so d. use care in moving or adjusting equipment so that your hands and clothing do not contact fan blades

INSTRUCTORS NOTES

TEACHING POINTS

Ref. Firefighter Occupational Safety, 1st ed., IFSTA #209

p. 151

3-15 Safety

3-15.1
3-15.3

5. Ventilation

e. insure that adequate screen or guards are installed on smoke ejector fans before using this equipment.

Opening all types of roofs for ventilation purposes requires caution, BUT BE ESPECIALLY CAREFUL WHEN OPENING PITCHED ROOFS.

a. place a roof ladder on the roof upwind and alongside the position where the cut will be made.

b. Make sure hooks are secured over the ridge

c. DO NOT walk on spongy or springy roofs - this is generally a sign that the structural members have weakened.

Lay a roof ladder on the roof to distribute the firefighters weight over a large area and secure a lifeline to ANY firefighter who is to enter a weakened roof area

d. when making the opening, stabd to the windward side of the cut and wear FULL PROTECTIVE CLOTHING.

6. Forcible Entry

Forcing entry into buildings will often necessitate the use of power tools and all safety precautions must be taken.

Other hand tools may also be employed and it is imperative that all firefighters know the correct way to use and maintain the tools.

Extensive training is an absolute both for safety and efficiency.

Firefighters should be trained in the proper methods of carrying such tools as:

axes
pike poles
plaster hooks

and warned against placing tools where they will create a tripping hazard.

When using a battering ram:

a. wear eye protection

2b. have charged lines in position

INSTRUCTORS NOTES

TEACHING POINTS

Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209

pp. 152-153

3-15 Safety

3-15.3

6. Forcible Entry

c. secure sufficient personnel to safely accomplish the task

When using an axe:

a. watch for overhead obstructions

b. fellow firefighters

When breaking glass:

a. stand to one side of window or door

b. completely clean all jagged glass from opening

c. on tempered glass use a salvage cover as a shield over the glass. Or if possible score glass and use a suction device pulling the glass inward.

d. use extreme care in breaking glass on upper floors as bystandres and firefighters below could be severel injured by the falling material.

e. when breaking glass in high rise buildings secure firefighter with a life line.

7. Building Collapse

Firefighters injured and killed annually due to building collapses are ever-increasing.

Measure to protect the firefighter must be taken before a building becomes involved in fire.

The building itself must be viewed as a possible hazard.

a. Fire inspectors and first due companies should examine the buildings in their areas for:

(1) Weakenesses in design.

(2) Structural alterations

(3) Deterioration

(4) Overstress

INSTRUCTORS NOTES

TEACHING POINTS

Ref: Firefighter Occupational Safety, 1st Ed., IFSTA #209

pp. 153-154

3-15 Safety

3-15.1

7. Building Collapse

b. all firefighters should have instruction in building construction and design

c. officers should have extensive knowledge in this area so they will not commit personnel to structurally unstable buildings.

During all fire prevention and in-service inspections by fire company personnel they should look for the following problems and have them entered on all pre fire plans:

- o Obvious cracks in masonry walls.
- o Steel angle iron used to reinforce walls. (this is commonly visible on exterior walls)
- o Deteriorated mortar and bricks.
- o "Stars" used with steel rods to brace walls.
- o Unproteced steel beams and trusses. (A 100-foot section of steel (I-beam) will elongate nine inches when heated to 1000 degrees F. (538 degrees C.)
- o Wood I-beams.
- o Wood Trusses.
- o Imitation timbers.
- o Marble stairways.
- o Heavily laden floors such as storage areas and machine rooms.

When finding any of these construction features, pre-plan the building carefully.

All of the above have been key factors resulting in building collapse.

Building construction will be characteristic of the area it is located in and the climate it must withstand.

Special effort should be directed towards the understanding of localized structural problems.

INSTRUCTORS NOTES	TEACHING POINTS
Ref. Firefighter Occupational Safety, 1st ed., IFSTA #209 pp. 153-154 3-15 Safety 3-15.1	7. Building Collapse If a structure is involved in fire, all fire service personnel at the scene must stay abreast of all conditions which may lead to a building collapse. While fighting the fire, and especially during overhaul, these signs may indicate the hazard of collapse: o Ankle-deep water on the floors. o Holes in floors. o Sagging floors, especially those losing support at beam ends. o Sliding sheets of plaster and rising plaster dust. o Steel beams that have been exposed to extensive heat and fire. o Spongy floors and roofs. o Burned out trusses. These indicate that before entering a building a brief look at exterior and interior conditions should be made. ESPECIALLY CHECK FLOOR AND ROOF SUPPORTS if there has been severe fire conditions.
pp. 212-213 3-15 Safety 3-15.2	8. Disorientation Another problem that firefighters face during fires is disorientation. Don't wander aimlessly. Crawl around the walls of a room and feel for windows if all vision is cut off by smoke. Should you become trapped in a hallway or stairs try to retreat down. NEVER GO UP. Keep your head upwards whether ascending or descending stairs, CRAWL. Follow hose line out of building, facing hose line locate coupling by feel, locate single butt and follow line to the right.

INSTRUCTORS NOTES

TEACHING POINTS

Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209

8. Disorientation

If unable to go down and out:

a. go to a room off the hallway and close the door behind you

b. open a window and straddle the sill. Call for help.

c. drop available articles out the window to attract attention

pp. 157-158

9. Power Tools

3-15 Safety

3-15.3

Power tools are frequently used to save lives but they must also be used safely to prevent injury to others as well.

All department personnel must be well trained in the use and operation of all power tools used by their department.

- Firefighters operating power tools must wear full protective clothing including eye protection.
- Safety guards must be provided and in use when tools are operated.
- Allow only those persons operating tools in area of operation.
- Use proper bits when using air chisels - do not power units with oxygen or any flammable gas.
- Use welding goggles and protective clothing when operating cutting torches - have a suitable size hose line charged and available when using this equipment. Do not use in an area where flammable liquids are spilled or stored.
- Use care when using pounding or breaker-type tools as bits of masonry may fly in all directions. Wear full protective clothing and eye protection when using this type of tool.
- Power saws create sparks and hot slag and should not be used in areas where flammable liquids are spilled or stored. Operating saws, particularly rotary accessories, may be a hazard due to their being operated at higher RPM speeds then they are designed for with the parts flying apart.

INSTRUCTORS NOTES

TEACHING POINTS

Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209

pp. 157-158

9. Power Tools

o Have a charged line in position when using this equipment.

o Do not attempt to make cuts from unsafe positions such as:

a. standing on sloped roofs

b. off the sides of ladders

O When making cuts above shoulder level, provide for frequent personnel rotation.

Firefighters operating in this position become numbed by the vibration and weakened by the unatural position and may become careless and be injured.

When operating the Hurst tool or similar equipment watch closely for "pinch points" especially when working close to a victim.

Also do not operate gasoline poweered units in area where flammable liquids or gases have been spilled or where the atmosphere is potentially explosive.

pp. 158-160

10. Ground Cover Fire Fighting

Since ground cover fires can injure or kill as readily as structural fires, proper safety precautions must be taken during such fire fighting operations.

o wear full protective clothing
(minimum protection - fire-resistant jump suits, safety helmets, gloves, goggles and some type of protective footwear.)

o Communications should be established and maintained between all personnel involved in the suppression activity.

o Apparatus should be equipped with safety devices such as:

Front platforms
Fire fighting stanchions
Restraining belts
Protection from brush
Two-way radio communications

INSTRUCTORS NOTES

TEACHING POINTS

Ref: Firefighter Occupational Safety, 1st ed., IFSTA #209

pp. 158-160

10. Ground Cover Fire Fighting

All heavy equipment operators must be well trained in the safety practices applicable to the care and operation of their equipment.

Protective clothing must be worn while operating this equipment and special safety features may be added such as a fire-resistant blanket fro the protection

Extreme care should be taken by operators of this equipment in smoke laden areas as the ground contour could change rapidly and there are fire service personnel working near the equipment.

Do not drive apparatus and equipment into the area of the fire - remain in the burned over portion.

Regular relief of fire fighting crews must be provided as fatigue could cost a life.

ALWAYS MAINTAIN AN ESCAPE ROUTE

- o back into the burned area
- o natural barriers such as rock ledges, riverbeds or streams will provide an escape route
- o in some cases manmade protection will be available such as aluminized tents.

11. Other Hazards

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Hazardous Materials

Toxic
Flammable
Explosive
Reactive
Radioactive

UNIT QUIZ

1. The injury statistics published by the International Association of Fire Fighters indicate that the greatest number of firefighters are injured at:

   (Circle the letter at the correct answer)

   a. fire station

   b. training

   c. false alarms

   d. responding/returning

   e. fire scene

   f. harassment

2. What are the most common injuries sustained by firefighters:

   (Circle the letter at the correct answer)

   a. over-exertion

   b. inhalation of toxic gases

   c. sprains/strains

   d. burns

   e. cuts

3. You have responded to an emergency incident and upon arrival find that an electrical transmission wire has dropped and is arcing. The safest action for you to take is to:

   (Circle the letter at the correct answer)

   a. leave it alone - do nothing

   b. immediately cut the wire two spans away

   c. lay lines to protect exposures

   d. clear area and notify power company

   e. send personnel to nearest sub-station to shut off power

4. When downed wires are encountered, a danger zone in either direction should be established. What is the minimum distance from the emergency scene that the zone should extend:

   (circle the letter at the correct answer)

   a. on either side

   b. one span in either direction

   c. at site of downed wires only

   d. two spans in either direction

5. The statement "allow power company personnel to handle all energized electrical equipment" is a good safety policy to follow. Under what circumstances might there be an exception to this policy:

   (Circle the letter at the correct answer)

   a. a transformer burning on a pole

   b. exposures have been ignited by arcing wires

   c. life is in immediate danger

   d. the energized wire is lying across an unoccupied vehicle

6. When opening pitched roofs it is essential that the firefighter:

   (Circle the letter at the correct answer)

   a. have an axe or power saw

   b. place a roof ladder on the roof alongside and upwind of cut location

   c. have a proper class of extinguisher

   d. raise an extension ladder

7. If the roof of a building is "spongy' or "springy" this generally an indication that:

   (Cirle the letter at the correct answer)

   a. it is a new roof

   b. that the roof covering has melted

   c. too many personnel are on the roof

   d. the structural members have weakened

8. When attempting forcible entry with a power saw it is essential that:

   (Circle the letter at the correct answer)

   a. the saw is always operated in the same position

   b. that all personnel are wearing full protective clothing and eye protection

   c. there are more personnel present than needed for the task

   d. only gasoline powered units are utilized

9. Name five (5) building construction features that could contribute to building collapse that should be noted during fire prevention and company in-service inspections:

   _____

   _____

   _____

   _____

   _____

10. During firefighting operations and especially overhaul, the firefighters must be alert for conditions which might result in the collapse of the structure. List five (5) of these signs:

    _____

    _____

    _____

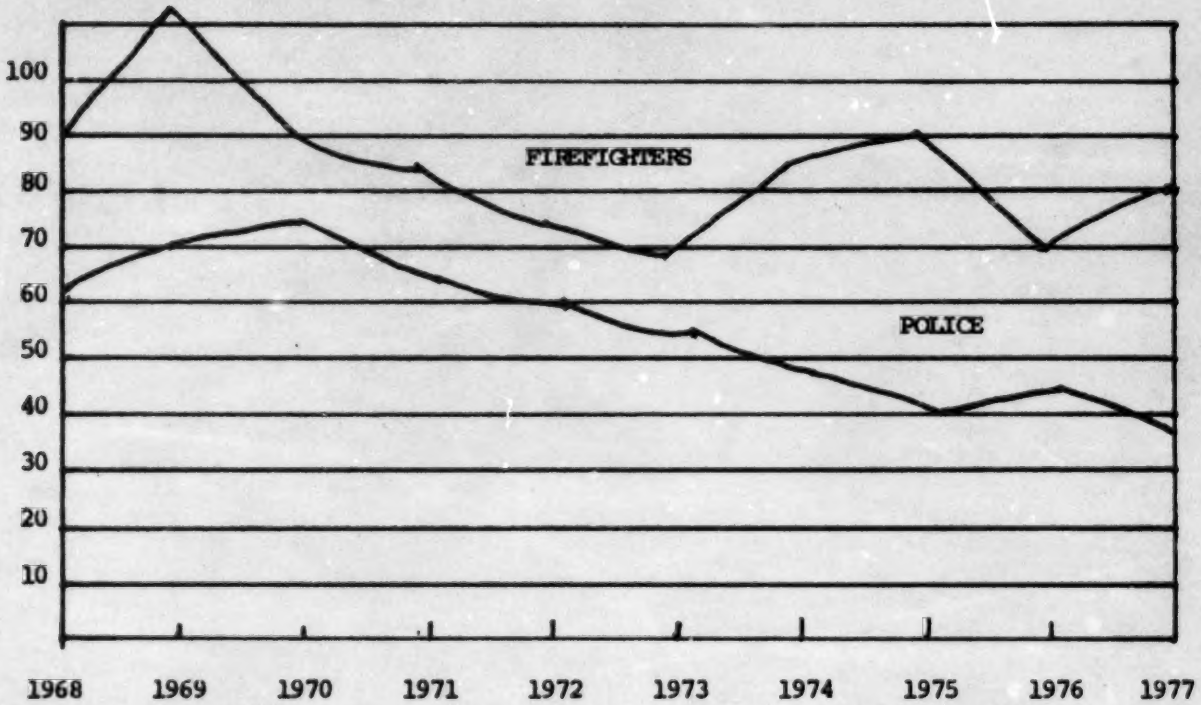
    _____

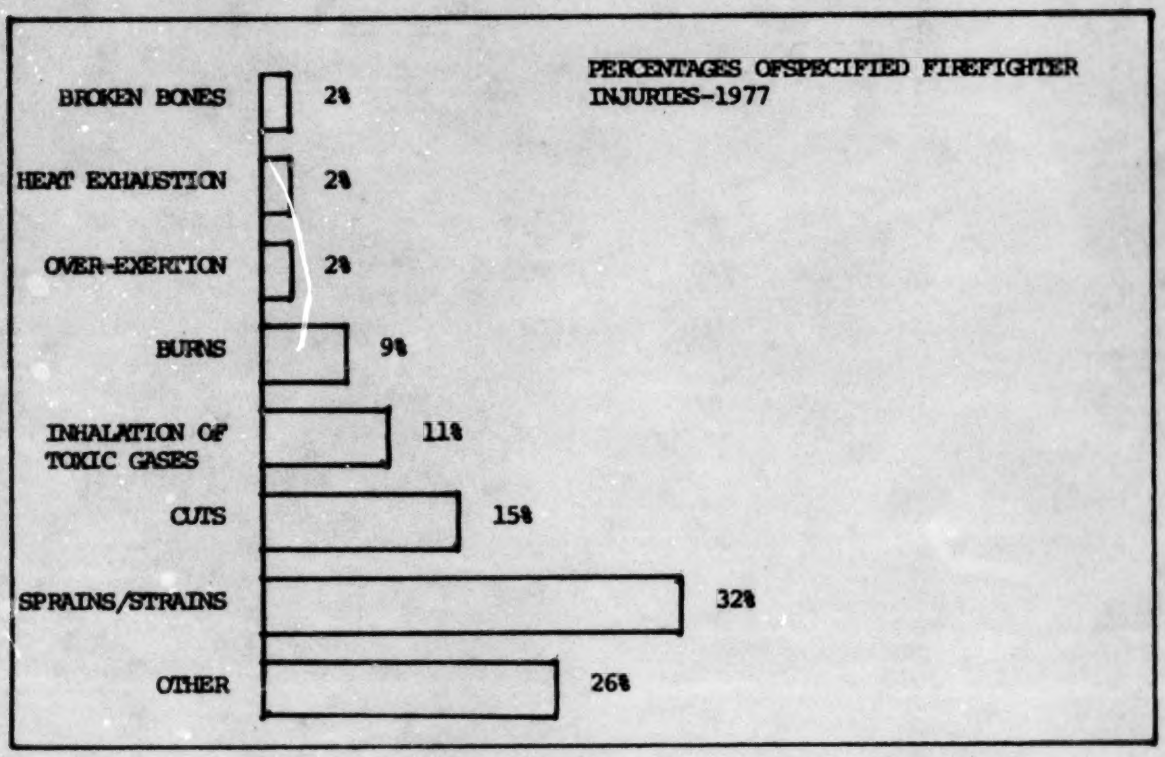
    _____

Answer Key

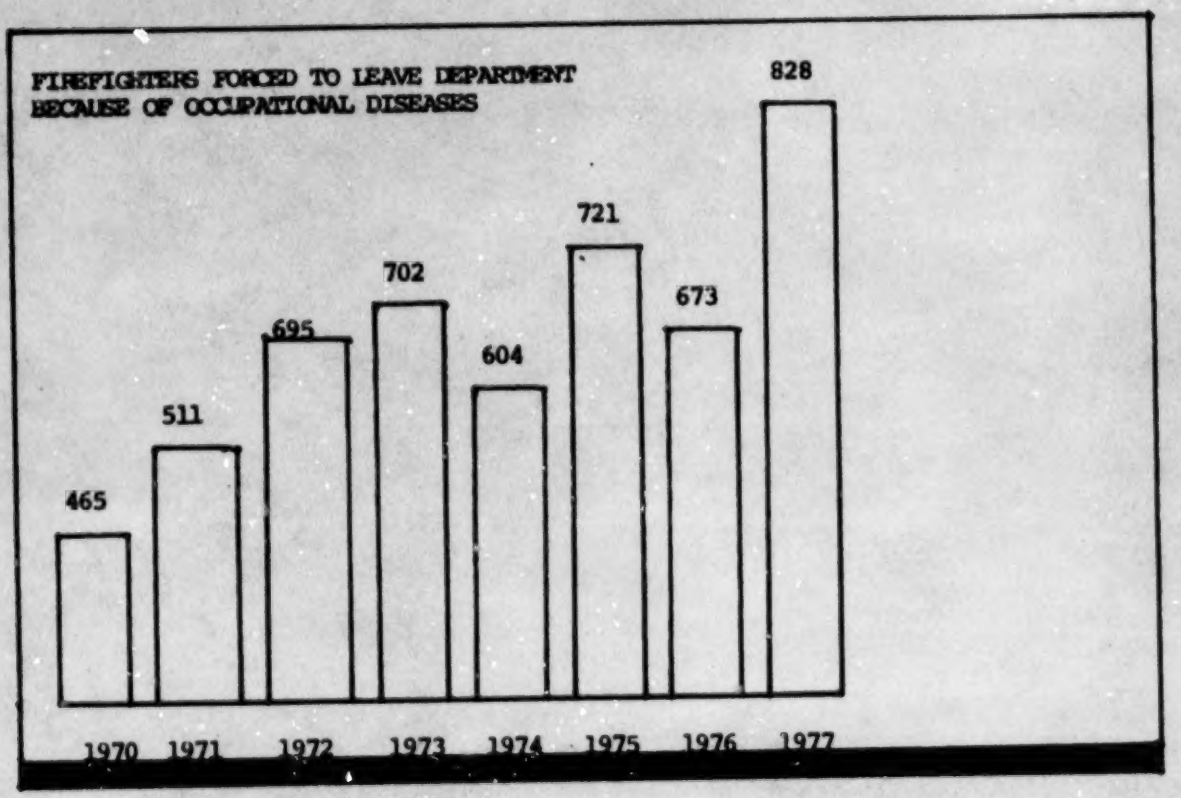
1. e.
2. c.
3. d.
4. b.
5. c.
6. b.
7. d.
8. b.
9. obvious cracks in masonry walls
   deteriorated mortar and bricks
   steel angle iron used to reinforce walls
   stars used with steel rods to brace walls
   unprotected steel beams and trusses
   wood I-beams
   wood trusses
   imitation timbers
   marble stairways
   heavily laden floors/storage/machine rooms
10. ankle-deep water on floors
    holes in floors
    sagging floors/loss of support at beam ends
    sliding sheets of plaster/rising plaster dust
    steel beams exposed to extensive heat of fire
    spongy roofs and floors
    burned out trusses

FIREFIGHTER AND POLICE DEATHS IN LINE OF DUTY
PER 100,000 EMPLOYEES-1969-1977



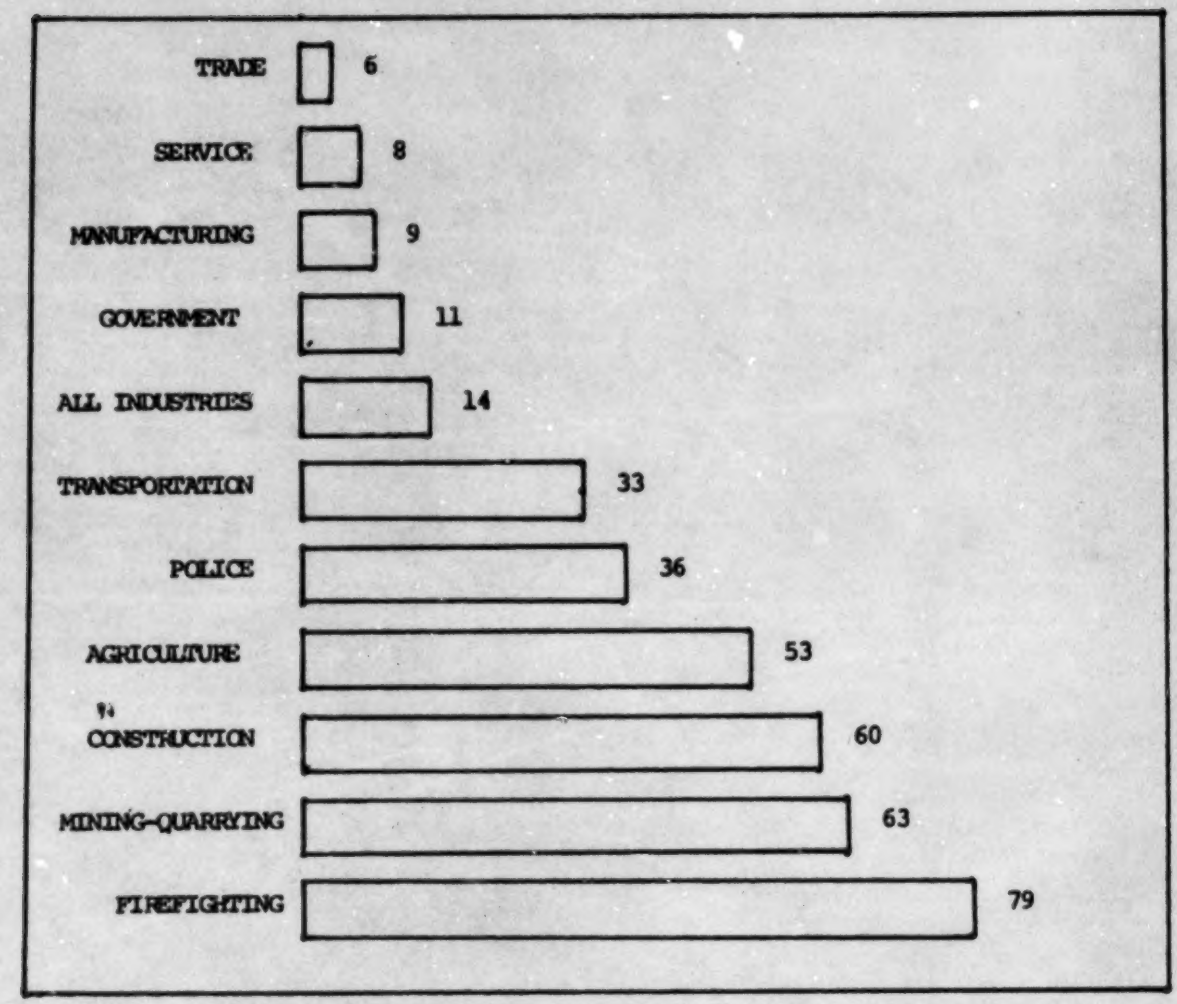


Injuries sustained at the fire scene comprise the overwhelming majority of firefighter injuries. Sprains and strains were the most common type injury sustained on the fire ground

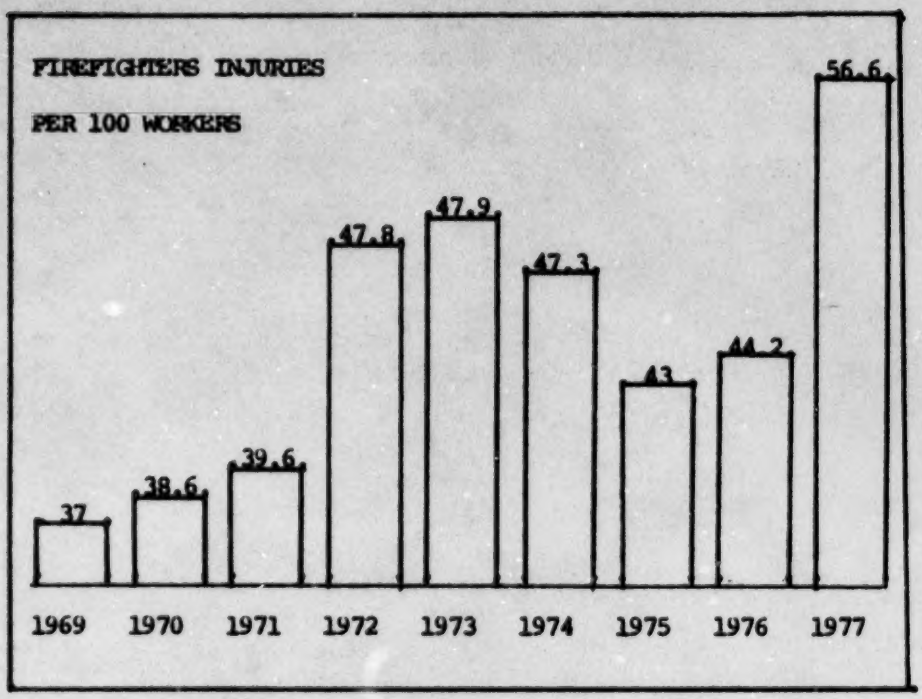


Of the 828 firefighters forced to leave the department because of occupational disease:

513 had heart disease
91 suffered lung damage
224 were not specified in the reports received



In comparing accidental work deaths in several professions it can be seen that fire fighting had the greater number of deaths. Per 100,000 workers, firefighters suffered more fatalities than even mining and construction personnel.



The statistics on this chart show that a firefighter has a greater than 50 percent chance of being injured during the year.

INJURIES SUSTAINED BY FIREFIGHTERS

FIRE SCENE	40,610	73.0%
FIRE STATION	9,502	17.0%
TRAINING	1,892	3.4%
RESPONDING TO OR RETURNING FROM ALARM	3,202	5.7%
FALSE ALARM RELATED	155	.3%
HARASSMENT	201	.4%

TYPICAL BRAKE PERFORMANCE

A - Average automobile

B - Light two-axle trucks

C - Heavy two-axle trucks

D - Three-axle trucks and trailers

SPEED (mph)	AVERAGE DRIVER REACTION DISTANCE (feet)	VEHICLE BRAKING DISTANCE (feet)				TOTAL STOPPING DISTANCE (feet)			
		A	B	C	D	A	B	C	D
10	11		7	10	13		18	21	24
15	17		17	22	29		34	39	46
20	22	22	30	40	50	44	52	62	72
25	28	31	46	64	80	59	74	92	108
30	33	45	67	92	115	78	100	125	148
35	39	58	92	125	160	97	131	164	199
40	44	80	125	165	205	124	169	209	249
45	50	103	165	210	260	153	215	260	310
50	55	131	225	255	320	186	280	310	375
55	61	165	275	310	390	226	336	371	451
60	66	202	360	370	465	268	426	436	531

The distance required to stop a vehicle from the time the need is perceived is influenced by three factors: the speed at which the vehicle is traveling; the reaction time of the driver or the time that lapses between the driver's perceiving the need to stop and actually applying the brakes; and the braking distance required by a particular vehicle.